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Le Président de l'Office européen des brevets
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(Falls die Bezeichnung der Erfindung nicht angegeben ist, siehe Beschreibung.
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System and method of handling a web service call

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SYSTEM AND METHOD OF HANDLING A WEB SERVICE CALL

TECHNICAL FIELD

The present invention relates generally to Internet and Web Services, and more particularly to a system and method of
5 handling a Web Service call in an asynchronous way.

BACKGROUND OF THE INVENTION

The World Wide Web latest innovation was the Web services, those business functions published to everyone onto the web. It is a new way to use the web, this new web model allows any
10 client user (a program for example, not necessarily a web browser) to initiate a transaction automatically.

By definition, Web Services are software components that can be described ,published, discovered and invoked dynamically in a distributed computing environment, generally the Web.

Web services have already proved their usefulness in real-world applications. However, the current standard Web service model is a synchronous one, based on a request/response architecture.

- 5 The several following patents illustrate some solutions to perform those operations associated with Browser requests on the World Wide Web.

U.S. Pat. N°6,317,786 from Yamane discloses a method and system for managing Web servers, and more particularly, to a
10 web service system operator to manage multiple Web servers. The system can manage traffic by directing web pages requests to available Web servers and balancing the web page request service load among the multiple servers. The system can collect data on web page requests and Web server responses to
15 those web page requests and provide reporting of the data as well as automatic and manual analysis tools.

U.S. Pat. N°6,247,056 from Chou discloses a system and method relating to server architectures in networked computer systems, and more specifically to a distributed architecture
20 for enabling servicing to user requests across different machines.

However, supporting real-world enterprise business processes inherently involves asynchronous operations, as the processes are long in duration. Activities of each process need to be
25 de-coupled from an initial request in order to optimize the use of system resources and to break the processing into a recoverable set of transactions.

Such asynchronous behavior is common for services that require complex processing that may take minutes or even days to
30 complete when, for example, the Web service implementation is

dependent on batch processing or manual steps requiring human intervention.

Therefore, there is a need for a Web Service system that avoids any data lost. And the present invention offers such
5 solution.

SUMMARY OF THE INVENTION

In view of the foregoing and other problems of the conventional systems and methods, it is an object of the invention to provide a system and method to handle
10 asynchronous Web Service in a fully transparent manner for the end user.

It is another object to provide a system and method that takes advantage of existing protocols and that does not need creation or usage of any specific transport layer or usage of
15 any framework.

Those objects are achieved by a system for handling a Web Service call by clients in a communication network. The system comprises a Client Requester for issuing client requests. The client requests may comprise at least one client request to
20 call a Web Service. The system also comprises a Callback Web Service that is coupled to the Client Requester for registering the at least one client request to call a Web Service and for invoking the called Web Service. And a Response Web Service is coupled to the Callback Web Service
25 for receiving a response to the at least one client request to call a Web Service and is also coupled to the Client Requester for delivering the response when a client request to obtain the response is issued from the Client Requester.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects, features and advantages of the invention will be better understood by reading the following more particular description of the invention in conjunction
5 with the accompanying drawings wherein:

Figure 1 is a conceptual view of the system of the present invention.

Figure 2 is a data flow illustrating the main steps for handling a Client request according to a preferred embodiment
10 of the present invention.

Figure 3 is a data flow illustrating from the Client side the main steps to subscribe to an already registered Web Service.

Figure 4 is a data flow illustrating the Callback Web Service to ask the Generic Callback Web Service for the completion of
15 the Web Service.

DETAILED DESCRIPTION OF THE INVENTION

Referring first to figure 1, there is depicted a pictorial representation of an Internet communication system 100 which may be utilized to implement the present invention.

20 Generally speaking, system 100 operates through the Internet 102 and includes a Client requester (a program for example) 104, a Callback Web Service 106, a Web Service 108 and a Response Web Service 110. In a preferred implementation, communication over the Internet is made according to the HTTP

protocol, as shown by arrows 112,114,118,120 and 122. It is to be appreciated that only the main characteristics of the Web environment useful for the understanding of the invention are here discussed and that a more complete description may be found for example in the 'TCP/IP Tutorial and Technical Overview' IBM Redbooks GG24-3376-06.

In system 100, Client Requester 104 communicates with Callback Web Service 106 to send a client request (114).

10 The Callback Web Service 106 invokes the Web Service 108 (figured by arrow 118) to wait for a response to the user request (figured by arrow 120).

The Callback Web Service 106 is also coupled to the Response Web Service 110 to deliver the response (figured by arrow 122).

15 Client Requester 104 is coupled to the Response Web Service 110 to receive the response (figured by arrow 112).

System 100 allows to provide a centralized Web Service to handle Web Service calls in an asynchronous way. The Callback Web Service allows users to register their request or to
20 subscribe to existing requests previously submitted. The Callback Web Service further allows to provide to the user an asynchronous answer through the Response Web Service. And finally, the Callback Web Service allows to manage when and how the requested Web Service is called and when and how the
25 answer is send back to the Client Requester.

One advantage of the proposed system is that there is no need of a special framework to be used or to be implemented to offer such facility. Standard Web Service protocols may be used at the client requester side, and preferably the SOAP
30 (Simple Object Access Protocol) one.

Referring now to figure 2, the main steps to operate the Callback Web Service 106 is now described.

Client requester 104 performs an initial request to a Web Service 'A' by submitting a Web Service call (114) to the
5 Callback Web Service 106. The Web Service Call includes at least the address of the requested Web Service, generally in the form of an Internet address '@ Web Service A', and a set of parameters 'paramA' . This set may include the following parameters :

- 10 • a 'WSTC' parameter to identify the Internet address of the Web Service to call;
- 'WSTCP' parameters to specify the parameters associated with the Web Service to call;
- a 'PT' ProtocoleType parameter to indicate which protocol to
15 be used for the communication;
- a 'RCBI' parameter to allow the user to configure binding information for sending the Web Service response to the client.

The 'PT' input parameter used to indicate to the Web Service
20 Callback the protocol used for the asynchronous response to the query may be for example:

- the Simple Object Access Protocol (SOAP) protocol in order that a client Web Service receives the response to the submitted request; or
- 25 • the Simple Mail Transfer Protocol (SMTP) protocol in order that the Web Service response being send to an e-mail address.

The binding information depends on the content of the 'PT' input parameter. It is in fact the address needed to connect to the Callback Web Service using the protocol defined by 'PT'. For example if the 'PT' parameter is set to 'SOAP' this
5 RCBI parameter will be the Internet address of the Callback Web Service. If the 'PT' parameter is set to 'SMTP' then the RCBI parameter will be the e-mail address of the Callback Service to send the response. The list of such communication type is not exhaustive and can be extended to any
10 communication protocol.

After receiving the request, the Callback Web Service scrubs a local repository (132) that contains pending requests with associated requesters. If a similar request having same parameters is present in the repository, then the new
15 requester is added to the list of clients to be answered to, otherwise if no similar request already exists, the new request is stored in the local repository along with the requester identity.

As an answer to this request (114), the Callback Web Service
20 106 sends back to the Client Requester an acknowledgment (figured by arrow 122) and the session between the Client Requester and the Callback Web Service is closed.

Simultaneously, the Callback Web Service 106 acting for the Client Requester forwards the initial request to the requested
25 Web Service 'A' in the form of a second Web Service call (figured by arrow 118) formatted in a second request having the same format as the initial request (114) issued from the Client Requester.

In response to the Callback Web Service request, the Web
30 Service 'A' provides the Callback Web Service with a response according to the HTTP protocol, as shown by arrow 120.

The Callback Web Service 106 then retrieves from the local Repository 132 the list of all the requesters corresponding to that Web Service 'A', and transfers to the Response Web Service (110) the response message 'Response A' (130) (as
5 shown by arrow 116) with corresponding requesters parameters.

Then, the requester may obtain the response message at any time on request from the Response Web Service.

It is to be appreciated that the Callback Web Service further provides a set of functions to allow a Client Requester to
10 request from the local repository the list of all current pending requests in order to directly add its own requester address to one or more requests of the list without the need of issuing an initial request 114. This process is detailed with reference to figure 3.

15 Figure 3 details the steps for a Client Requester to subscribe to an already submitted Web Service call. Firstly, the Client Requester submits a 'get pending' request (301) in the form of a Web Service call to the Callback Web Service to obtain a list of all the pending Web Services already registered.
20 Preferably, the format of the response (303) contains at least, a unique identifier for identifying each pending Web Service, the address and the input parameters associated with each pending Web Service. The list of the pending Web Services is provided by the Callback Web Service by scanning through
25 its local repository (132). Then the Client Requester may subscribe to one or more Web Service listed in the response (303). A subscribe request (304) is then initiated by the Client Requester (104) and having as input parameter the unique identifier of the Web Service as listed in the
30 previously received response (303), and the address of the Response Web Service. The Callback Web Service (106) sends back an acknowledgment (305) to the Client Requester (104) and the process to obtain the response message 'Response A' (130)

is identical to the one previously described with reference to figure 2.

Another additional function may allow a Client Requester to perform an unregistration for a Web Service. After receiving a
5 response to a 'get pending' request, the Client Requester submits an 'unsubscribe' message to the Callback Web Service and having as input parameter the unique identifier of the Web Service. The Callback Web Service sends back an acknowledgment to the Client Requester which is then unsubscribed.

10 It is to be appreciated by those skilled in the art that while the invention has been particularly shown and described with reference to a preferred embodiment thereof, various changes in form and details may be made without departing from the spirit and scope of the invention.

15 Particularly, a polling method may be implemented to ask the Callback Web Service for the completion of the Web Service instead of having a temporary Web Service. This alternate workflow is described in figure 4.

Figure 4 details the steps for a Client Requester (104) to ask
20 the Callback Web Service for the completion of the Web Service. Client requester performs an initial request to a Web Service 'A' by submitting a request (114) to the Callback Web Service 106.

As an answer to this request, the Callback Web Service 106
25 sends back to the Client Requester the request ID (401) and the session between the Client Requester and the Callback Web Service is closed. Simultaneously, the Callback Web Service 106 acting for the Client Requester forwards the initial request to the requested Web Service 'A' in the form of a
30 second Web Service call (118) formatted in a second request

having the same format as the initial request issued from the Client Requester.

Then, at any time, the Client requester may send a 'Get Status' message (402) to ask the Callback Web Service for the
5 completion of the Web Service.

If the response message 'Response A' (130) is available in the Callback Web Service 106, it is transferred as an answer (404) to the Client requester 104, otherwise if it is not available, a 'Not Completed' message (406) is sent.

CLAIMS

1. A system for handling a Web Service call by clients in a communication network comprising:

5 Client Requester means (104) for issuing client requests comprising at least one client request to call a Web Service (108);

Callback Web Service means (106,132) coupled to the Client Requester means for registering the at least one client request to call a Web Service and for invoking the called Web Service;

Response Web Service means (110) coupled to the Callback Web Service means for receiving a response to the at least one client request to call a Web Service and coupled to the Client Requester means for delivering the response when a client request to obtain the response is issued from the Client Requester means.

2. The system of claim 1 wherein the Callback Web Service means further comprise storage means (132) to store a client identity along with a client request.

3. The system of claim 2 wherein the Callback Web Service means further comprise means for determining whether the at least one client request to call a Web Service is already stored or not within the storage means.

25 4. The system of anyone of claims 1 to 3 wherein the client requests further comprise at least one client request to subscribe to an already stored at least one client request to call a Web Service.

5. The system of anyone of claims 1 to 4 wherein the at least one client request to call a Web Service comprises at least one parameter to define a protocol to be used for delivering the response to the client.

5 6. The system of claim 5 wherein the protocol is a Simple Mail Transfer Protocol (SMTP) or a Simple Object Access Protocol (SOAP).

7. A method for handling a Web Service call by a client in a communication network comprising the steps of:

10 issuing at least one client request to call a Web Service from a Client Requester;

registering the at least one client request to call a Web Service within a Callback Web Service, and invoking the called Web Service;

15 receiving a response to the at least one client request to call a Web Service within a Response Web Service; and

delivering the response when a client request to obtain the response is issued from the Client Requester means.

20 8. The method of claim 7 further comprising after the registering step, the step of storing a client identity along with a client request.

25 9. The method of claim 8 further comprising after the issuing step, the step of determining whether the at least one client request to call a Web Service is already stored or not.

10. A computer program product stored on computer usable medium, comprising computer readable program means for causing

a computer to perform a method according to any one of claims 7 to 9.

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**SYSTEM AND METHOD OF HANDLING AS A GENERIC MODE AN
ASYNCHRONOUS WEBSERVICE CALL**

ABSTRACT

5 A system for handling a Web Service call by clients in a
communication network is disclosed. The system comprises a
Client Requester for issuing client requests. The client
requests may comprise at least one client request to call a
Web Service. The system also comprises a Callback Web Service
10 that is coupled to the Client Requester for registering the at
least one client request to call a Web Service and for
invoking the called Web Service. And a Response Web Service is
coupled to the Callback Web Service for receiving a response
to the at least one client request to call a Web Service and
is also coupled to the Client Requester for delivering the
15 response when a client request to obtain the response is
issued from the Client Requester.

Fig.1

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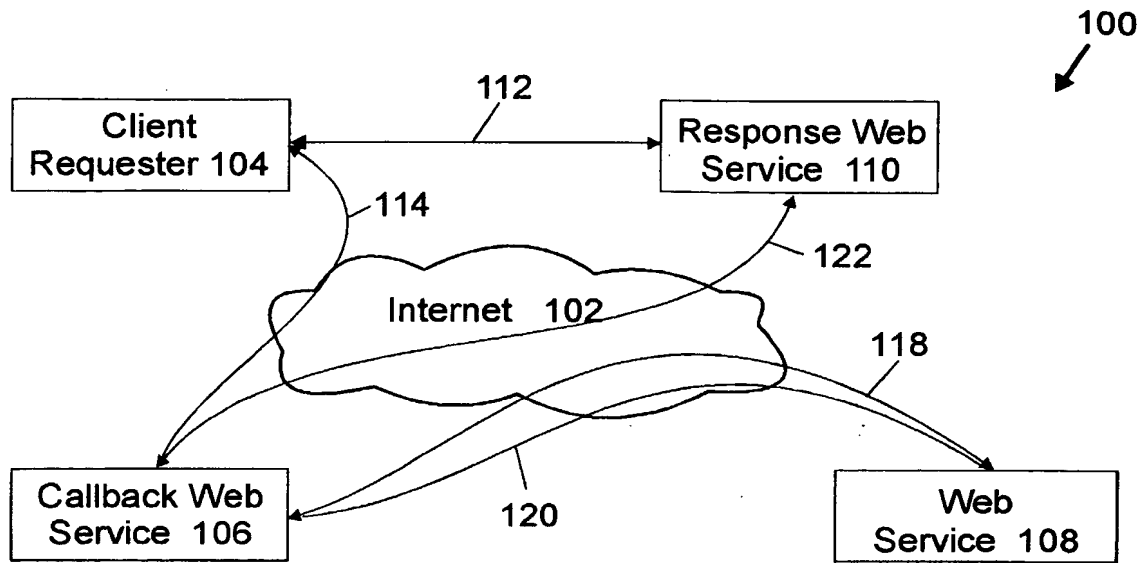


FIG. 1

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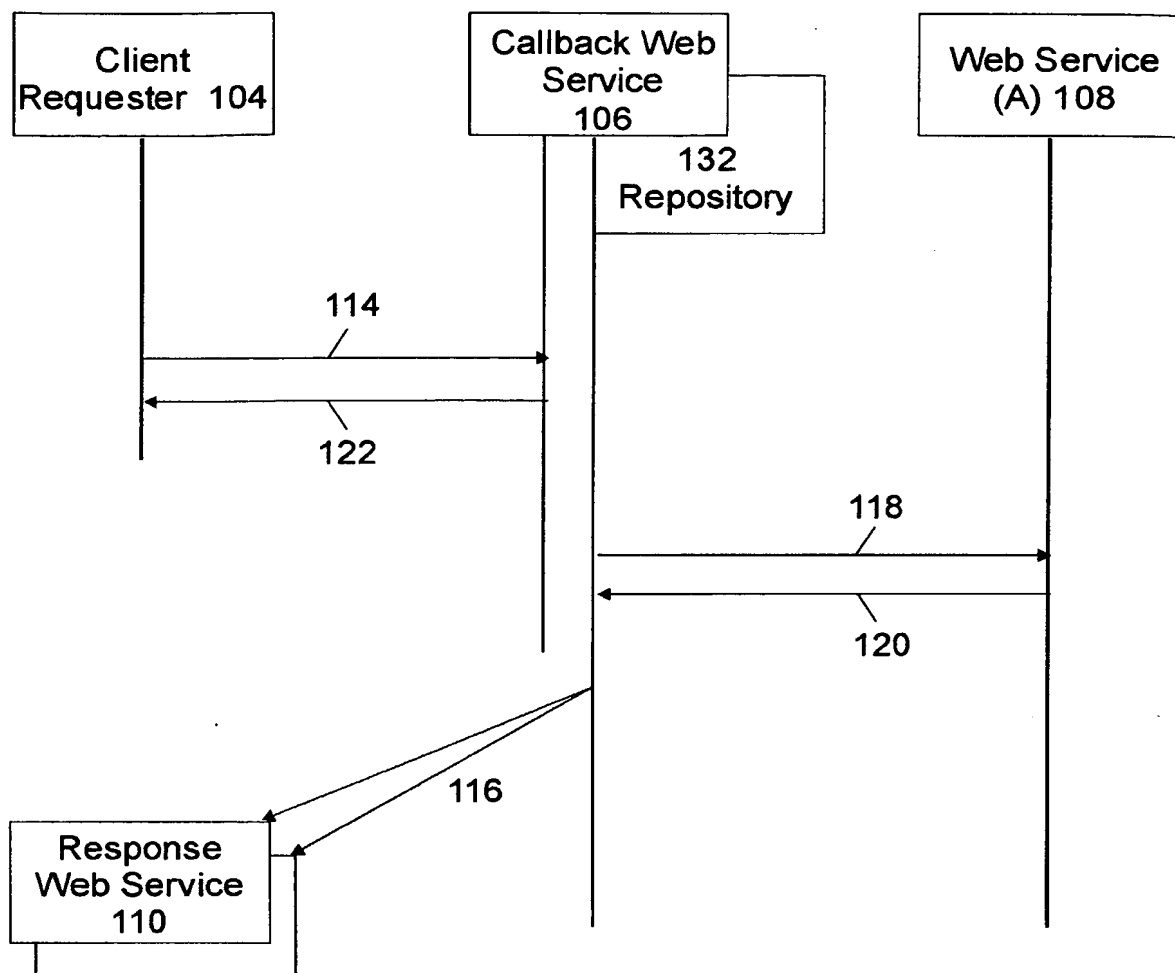


FIG. 2

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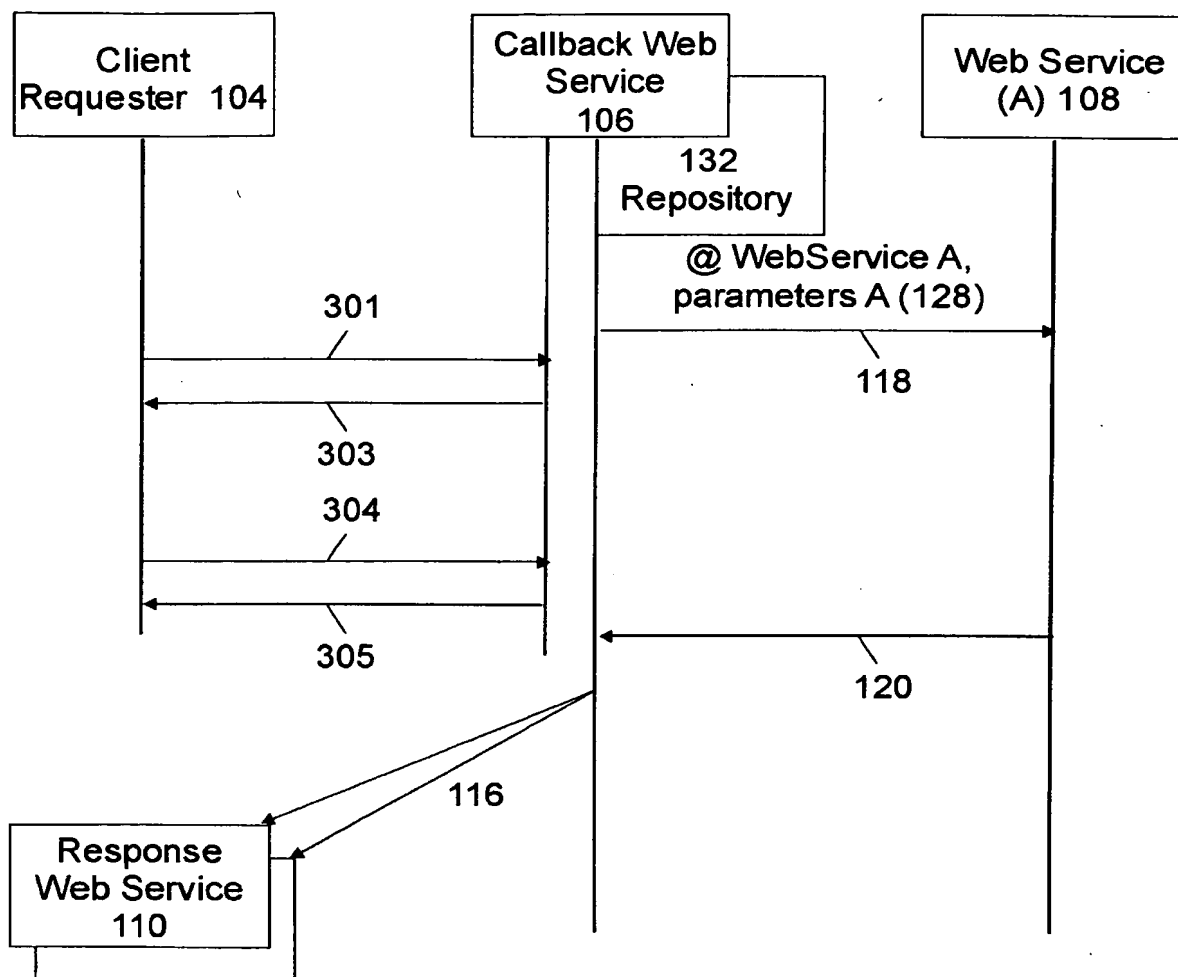


FIG. 3

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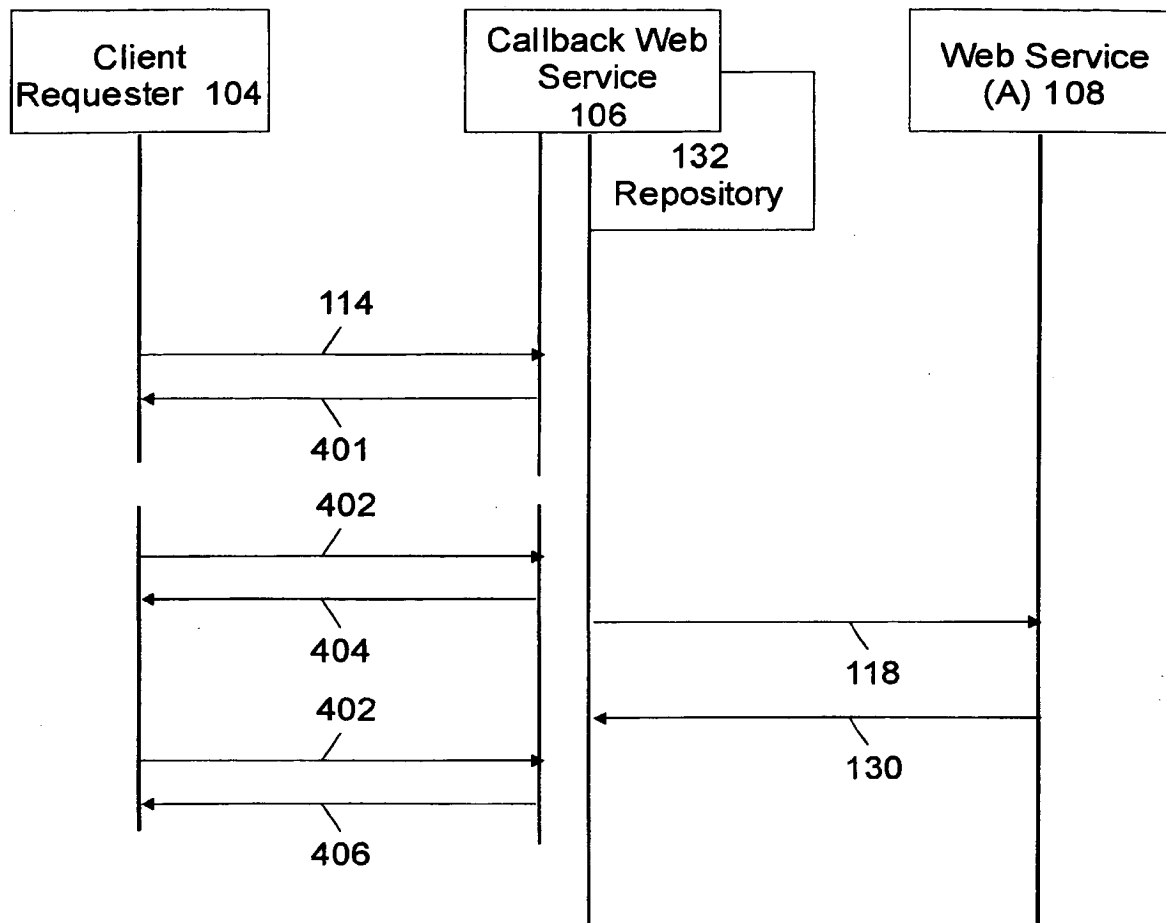


FIG. 4